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The Mix of the Mixed Economy--A Cross-Country Perspective

Hans Brems

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Hans Brems, Professor
Department of Economics

THE MIX OF THE MIXED ECONOMY--A CROSS-COUNTRY PERSPECTIVE

Abstract

The paper is a cross-country regression analysis estimating six elasticities of economic variables with respect to the size of government. The elasticity of the rate of inflation is found to be positive, high, and statistically significant. The elasticity of the participation rate is found to be slightly positive but not to differ significantly from zero. The elasticity of hours per worker is found to be slightly negative but not to differ significantly from zero. The elasticity of overall labor supply is found to be minuscule and not to differ significantly from zero. The elasticity of the gross saving ratio is found to be negative, numerically high, and statistically significant. So is the elasticity of the rate of growth.

August 4, 1989

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THE MIX OF THE MIXED ECONOMY--A CROSS-COUNTRY PERSPECTIVE

By HANS BREMS*

The mix of the mixed economy has several dimensions each of which displays considerable variation among OECD countries. At the one extreme one usually finds Japan, at the other, Sweden.

The purpose of the present paper is to use such variation for a cross-country analysis of the effects of the size of government. We shall examine the effects upon inflation, participation rate, hours per worker, overall labor supply, gross saving, and growth.

The following notation will be used.

E ≡ total employment

e ≡ government employment

F ≡ labor force

g ≡ rate of growth of real gross domestic product

i ≡ rate of inflation

$\kappa \equiv$ physical marginal productivity of capital stock

L ≡ hours worked per week by labor force

P ≡ population from 15 to 64

R ≡ government current receipts

r ≡ before-tax nominal rate of interest

$\rho \equiv$ after-tax real rate of interest

S ≡ gross saving

T ≡ tax rate

Y ≡ gross domestic product

I. GOVERNMENT, LARGE AND SMALL

1. Government as an Employer

For 1980-1986 the OECD (1988b: 38) reports government employment as a percentage of total employment, e/E:

Sweden	32.2
European Community	17.1
United States	16.2
Switzerland	11.0
Japan	6.6

The Swedish percentage is the highest and the Japanese one the lowest among OECD countries. The cross-country range is very wide: the Japanese percentage is a mere 20 percent of the Swedish one.

2. Government as a Redistributor

For 1980-1986 the OECD (1988b: 63) reports social-security transfers as a percentage of gross domestic product:

Sweden	18.3
European Community	18.2
Switzerland	13.3
United States	11.3
Japan	10.9

Here the Swedish percentage is not the highest among OECD countries and the Japanese one not the lowest. Between them the cross-country range is moderate: the Japanese percentage is 60 percent of the Swedish one.

3. Government as a Final Consumer

For 1980-1986 the OECD (1988b: 62) reports government final consumption as a percentage of gross domestic product:

Sweden	28.3
European Community	18.9
United States	18.1
Switzerland	13.1
Japan	9.9

The Swedish percentage is the highest and the Japanese one the lowest among OECD countries. The cross-country range is now wider: the Japanese percentage is merely 35 percent of the Swedish one.

4. Government as a Tax Collector

Government transfers, subsidies, interest payments, final consumption, and gross capital formation must be financed. For 1980-1986 the OECD (1988b: 64) reports government receipts as a percentage of gross domestic product, R/Y:

Sweden	59.2
European Community	43.2
Switzerland	33.9
United States	31.1
Japan	29.8

The Swedish percentage is the highest and the Japanese one the lowest among OECD countries. The Japanese percentage is 50 percent of the Swedish one.

5. Cross-Country Regressions

Such wide variation tempts us to use cross-country regression analysis to illuminate the effects of the size of government, and we shall find it convenient to use regressions of the constant-elasticity

type: let a dependent variable y be a function of an independent variable x, and let the function be linear in its logarithms:

$$\log y = \log a + b \log x \tag{1}$$

where a and b are its parameters. The function itself

$$y = ax^b \tag{2}$$

will then have the constant elasticity $d\log y/d\log x = b$ and appear as a straight line when drawn on double-logarithmic paper. Its elasticity b will conveniently appear as the steepness of that line.

Our regressions will use a small sample of ten advanced North American, Northwestern European, and Pacific-rim countries, i.e., Australia (A), Canada (CND), Denmark (DK), France (F), Germany (D), Japan (J), Sweden (S), Switzerland (CH), United Kingdom (UK), and the United States (US). Data used are found in tables I-III in our appendix.

Let us begin with the effect of size of government upon rate of inflation.

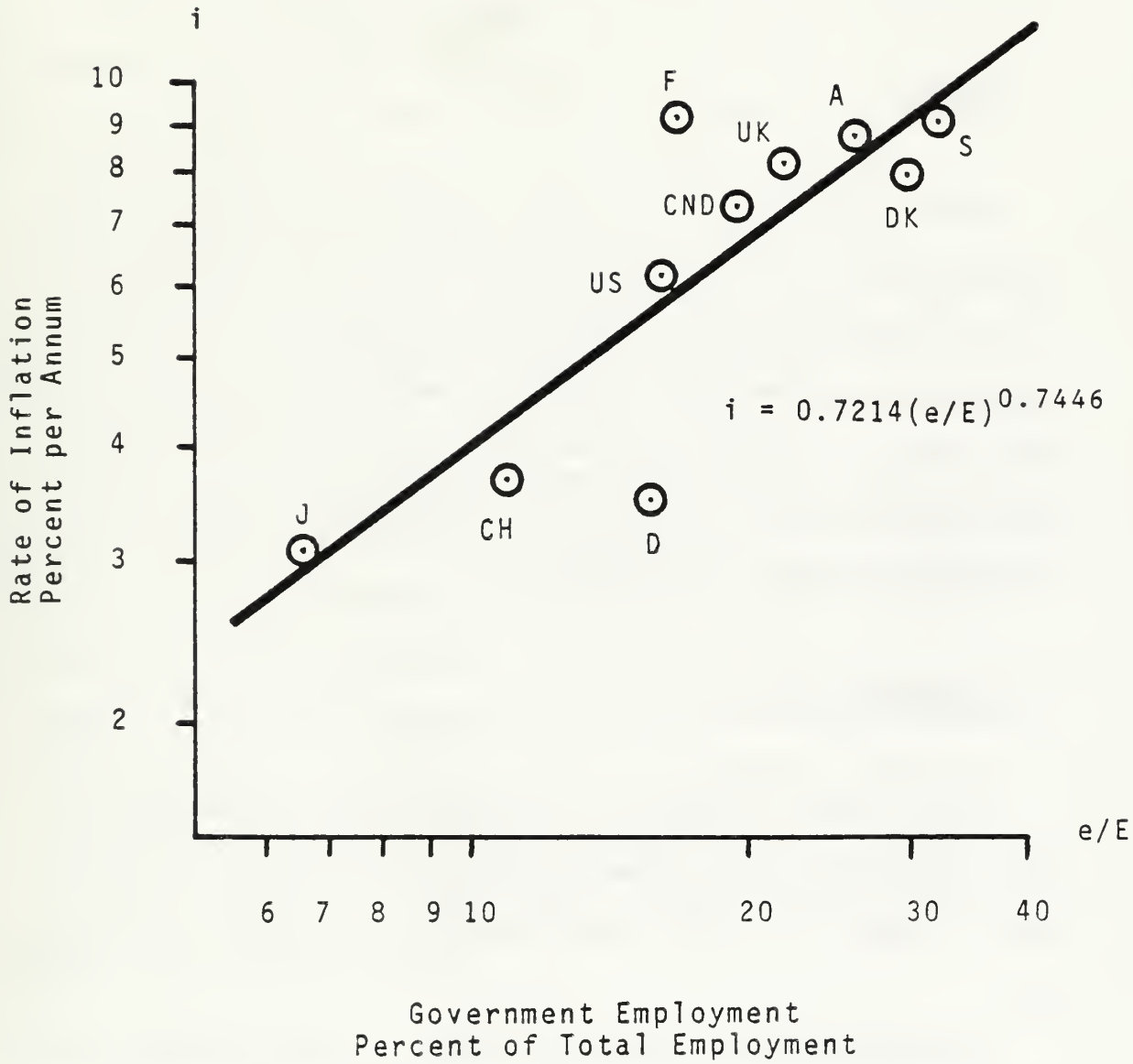
i
10
9
8
7
6
5
4
3
2
F
A
UK
S
CND
DK
US
J
CH
D
i = 0.7214(e/E)^0.7446
Rate of Inflation
Percent per Annum
e/E
6
7
8
9
10
20
30
40
Government Employment
Percent of Total Employment

Figure 1

II. GOVERNMENT AND INFLATION

1. Figure 1

Regress the two columns of table I and find the elasticity 0.745 of the rate of inflation i with respect to government employment e/E to be clearly positive and to be a full 4.35 times its own standard error hence to differ from zero at a one percent level of significance. This particular regression is our most successful one, and we may safely conclude that a higher rate of inflation will go with higher government employment. Why should it?

2. Interpretation

Private industry produces for a market, often an international market with price-elastic demand. Private industry can go bankrupt and will after a protracted profits squeeze not relieved by devaluation.

Government does not produce for a market but produces public goods and is required by law to deliver them. Government cannot go bankrupt but can always tax and borrow. As a result government resistance

to wage demands can be expected to be weaker than the resistance of private industry.

Swedish experience is illuminating. Swedish civil servants won the right to strike in the seventies and in the eighties became increasingly militant. Until 1975 industry traditionally opened collective bargaining. But after 1975 the rapidly growing public sector has increasingly assumed the role of a wage leader.

We shall understand the role of government as a wage leader even better when we look at wage differentials within government: government wage differentials are traditionally narrower than private ones. At the top end of the scale the highest-paid government employees are paid less than the highest-paid private ones. As a result government finds it difficult to keep its best computer experts, tax experts, professors, or airforce pilots. At the opposite end of the scale the lowest-paid government employees are paid more than the lowest-paid private ones. The private sector finds it difficult to keep its skilled blue-collar workers, and wage drift results.

All this leads us to expect high government employment to make an economy more inflation-prone.

III. TAX AND LABOR SUPPLY

1. Tax Burden

Let income recipients harbor neither money nor tax illusions, then what matters for their supply of labor will be after-tax real income. A flat direct tax rate of T percent will reduce such income by reducing money income by T percent at unchanged prices. A flat indirect tax rate of T percent will reduce it by raising all prices by T percent at unchanged money income.

With indirect taxes included the overall tax rate displays less progression, if any, than does the direct tax rate. International data on progression are not readily available. So as a first approximation let us ignore progression altogether and define our tax burden simply as government receipts in percent of gross domestic product, R/Y. Will such a tax burden affect labor supply?

2. Dimensions of Labor Supply

Labor supply has two dimensions: how large a fraction of the population is working and for how long? In our notation the first

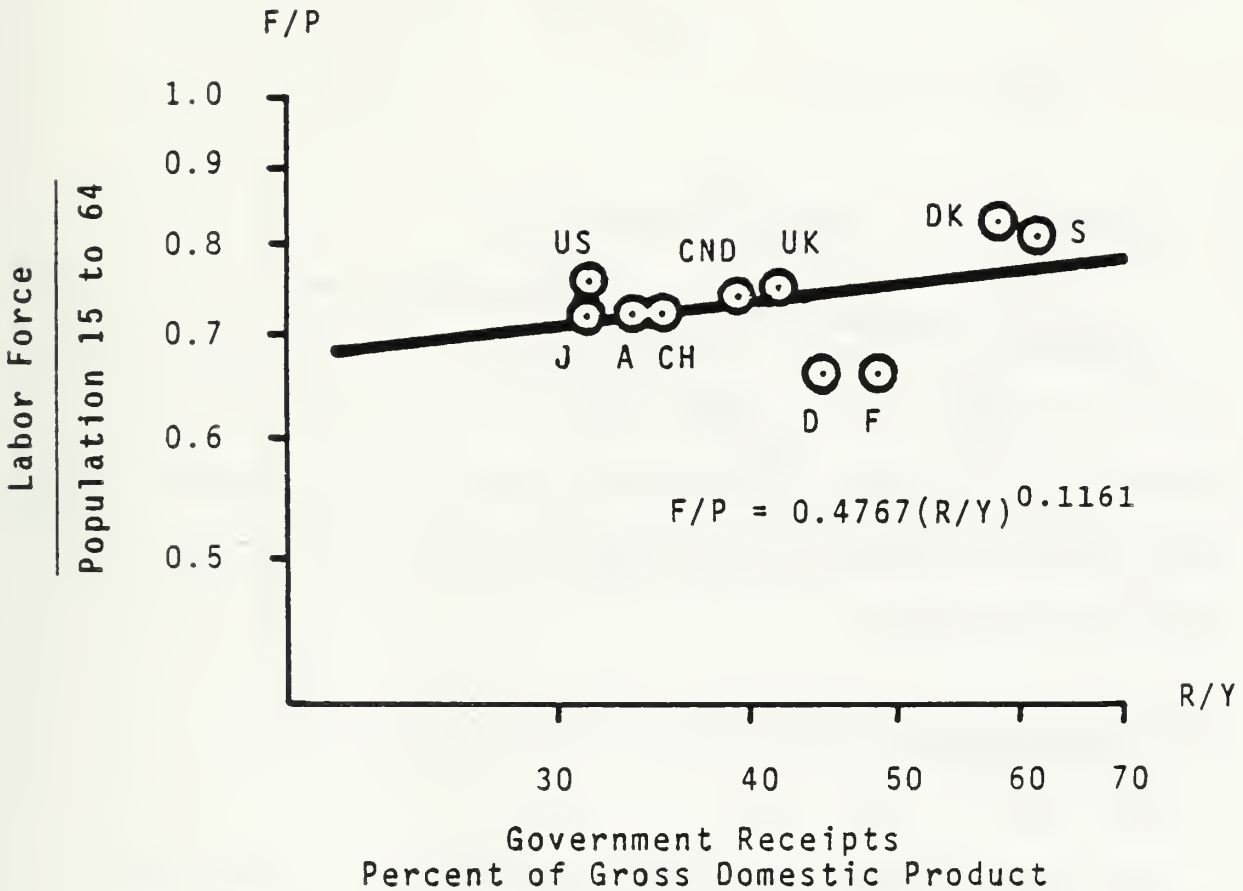
F/P
1.0
0.9
0.8
0.7
0.6
0.5
Labor Force
Population 15 to 64
US
CND
UK
DK
S
J
A
CH
D
F
F/P = 0.4767(R/Y)^0.1161
R/Y
30
40
50
60
70
Government Receipts
Percent of Gross Domestic Product

Figure 2

dimension is the participation rate F/P. The second dimension is hours per week per worker L/F. Overall labor supply is their product, hours per week per head:

$$(F/P)(L/F) \equiv L/P \qquad (3)$$

3. Figure 2: First Dimension of Labor Supply

Regress first and fourth columns of table II and find the elasticity 0.116 of the participation rate F/P with respect to the tax burden R/Y to be slightly positive but to be a mere 1.17 times its own standard error hence not to differ from zero at a ten percent level of significance.

4. Interpretation

Let income and leisure be substitutes. At a high tax rate another breadwinner adds less after-tax income and may not be worth the while: the substitution effect upon the participation rate is negative. But at a high tax rate the household can also afford less of everything and may try to keep up after-tax income by adding another breadwinner: the income effect upon the participation rate is positive. The

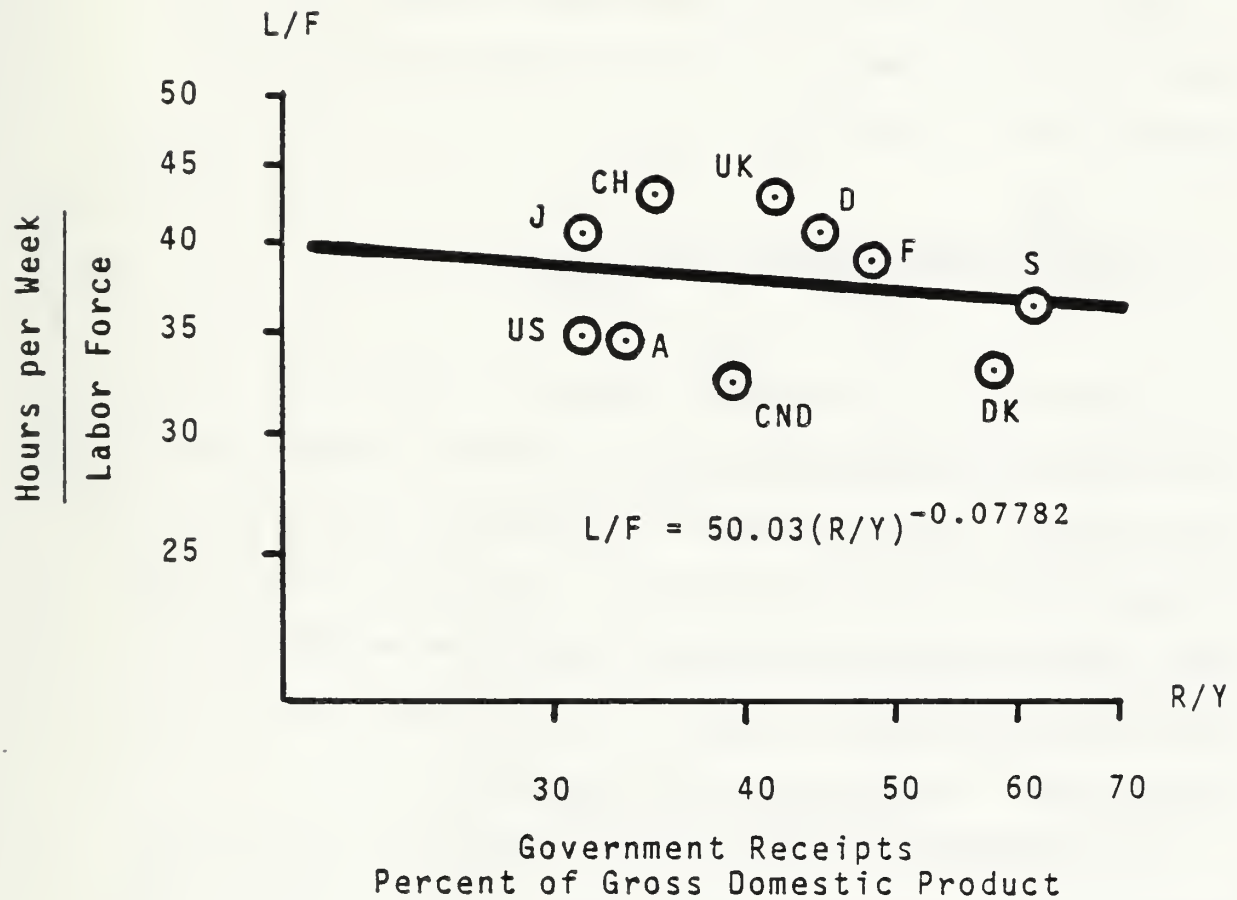
L/F
Hours per Week
Labor Force
50
45
40
35
30
25
CH
UK
D
J
F
S
US
A
CND
DK
L/F = 50.03(R/Y)^-0.07782
R/Y
30
40
50
60
70
Government Receipts
Percent of Gross Domestic Product

Figure 3

substitution effect and the income effect pull in opposite directions. Their balance may be small and precarious and go either way. In figure 2 it is small and goes positive: the income effect is winning--a finding not inconsistent with conventional findings on the labor supply of wives as summarized by Aron and Pechman (1981: 2) or Bosworth (1984: 142-143).

5. Figure 3: Second Dimension of Labor Supply

We must now turn to the second dimension of labor supply, and here we encounter a difficulty. No data on hours are known to the writer except those published by the International Labour Office. ILO data are less uniform than OECD data: some refer to hours paid for, others to hours actually worked. For nine countries the data refer to all nonagricultural activities but for Denmark merely to manufacturing. We must use the data as they come.

Regress second and fourth columns of table II and find the elasticity -0.0778 of hours per week per worker L/F with respect to the tax burden R/Y to be very slightly negative but to be a mere -0.516 times its own standard error hence not to differ from zero at a ten percent level of significance.

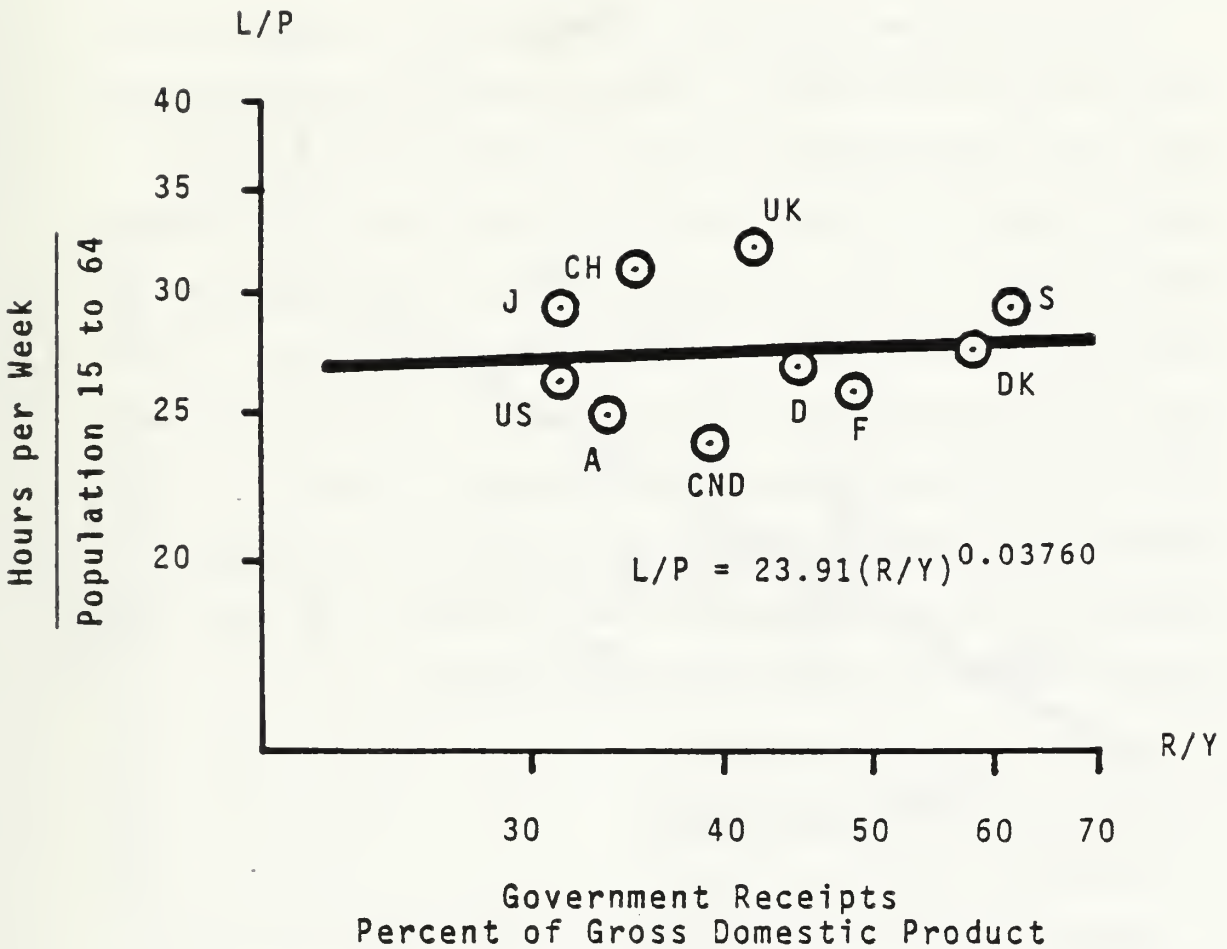
L/P
Hours per Week
Population 15 to 64
40
35
30
25
20
UK
CH
J
S
DK
US
D
F
A
CND
L/P = 23.91(R/Y)^0.03760
R/Y
30
40
50
60
70
Government Receipts
Percent of Gross Domestic Product

Figure 4

6. Interpretation

Again let income and leisure be substitutes. At a high tax rate another hour of work adds less after-tax income and may not be worth the while: the substitution effect upon hours worked is negative. But at a high tax rate the household can also afford less of everything and may try to keep up after-tax income by adding another hour of work: the income effect upon hours worked is positive. The substitution effect and the income effect pull in opposite directions. Their balance may be small and precarious and go either way. In figure 3 it is small and goes negative: the substitution effect is winning--a finding not inconsistent with findings on the labor supply of males by Hausman (1981) and Fullerton (1982).

7. Figure 4: Overall Labor Supply

Regress third and fourth columns of table II and find the elasticity 0.0376 of hours per week per head 15 to 64, L/P, with respect to the tax burden R/Y to be minuscule and be a minuscule 0.272 times its own standard error hence not to differ from zero at a ten percent level of significance. In English: we certainly cannot reject the

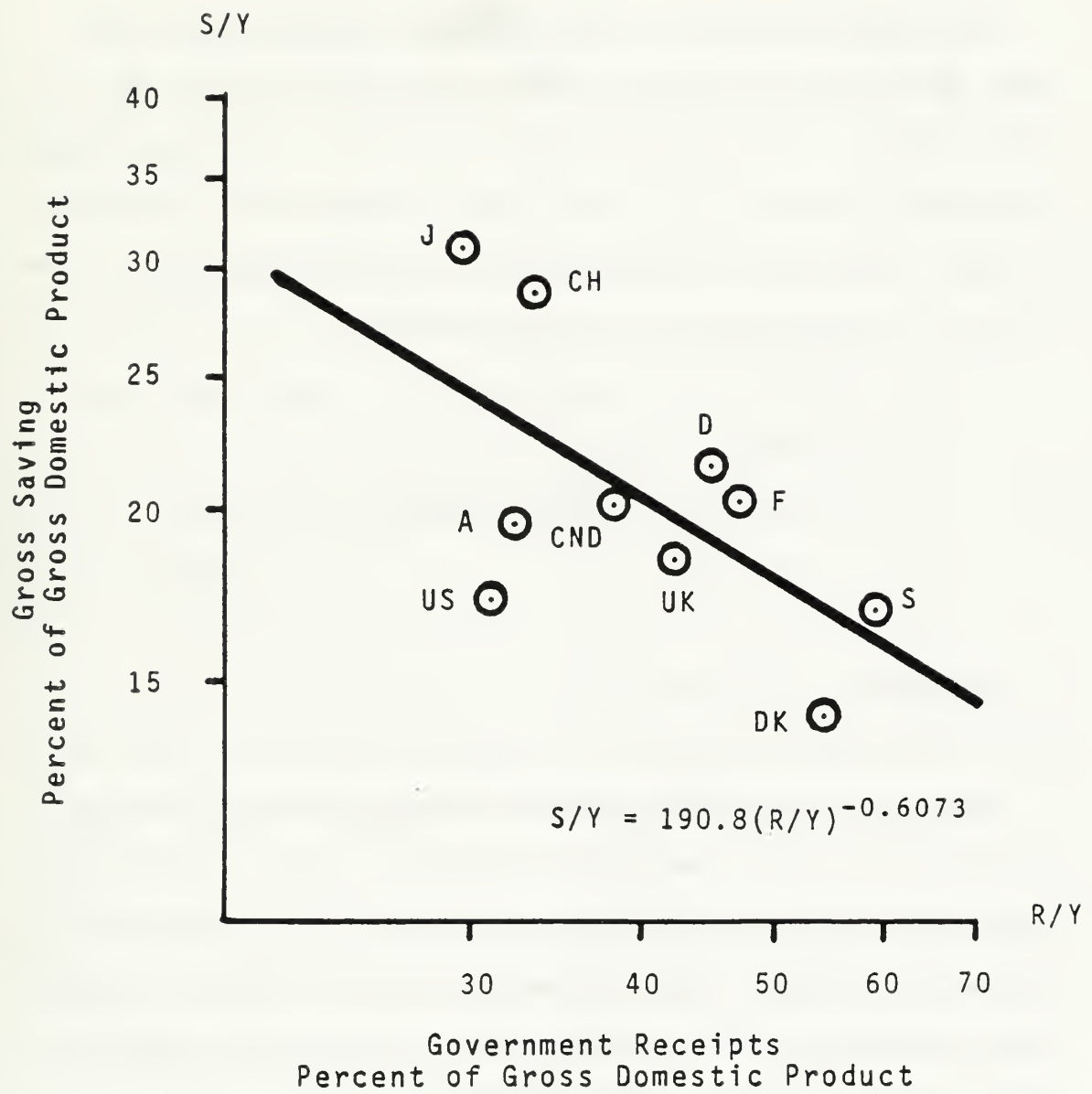
S/Y
40
35
30
25
20
15
Gross Saving
Percent of Gross Domestic Product
J
CH
D
F
A
CND
US
UK
S
DK
S/Y = 190.8(R/Y)^-0.6073
R/Y
30
40
50
60
70
Government Receipts
Percent of Gross Domestic Product

Figure 5

hypothesis that the tax burden has no effect upon overall labor supply.

This is not surprising. The balances of figures 2 and 3 were small and precarious balances between a substitution effect and an income effect. They could go either way and did: they were positive and negative, respectively. Now because of equation (3) the balance of figure 4 is itself a balance between the balances of figures 2 and 3--hence even smaller and even more precarious.

IV. TAX AND SAVING

1. Figure 5

Regress first and third columns of table III and find the elasticity -0.607 of gross saving S/Y with respect to the tax burden R/Y to be clearly negative and to be a respectable -2.17 times its own standard error hence to differ from zero at a six percent level of significance. We conclude that a lower gross saving ratio will go with a higher tax burden. Why should it?

2. Interpretation: Macroeconomics

On the macroeconomics of saving and taxes early writers as different as Sir James Steuart (1767) and Adam Smith (1776) agreed. The former wrote:

> ...Taxes draw money into circulation... It is no objection to this representation of the matter, that the persons from whom the money is taken, would have spent it as well as the state. The answer is, that it might be so, or not: whereas when the state gets it, it will be spent undoubtedly.

Adam Smith wrote succinctly: "[Kings and ministers] are themselves always, and without exception, the greatest spendthrifts in the society." Do such eighteenth-century observations apply to modern welfare states?

To begin with, not only may modern governments fail to save; they typically dissave: as reported by OECD (1988b: 64) for 1980-1986 all the governments of our ten countries except the Swiss one had outlays in excess of their receipts.

As we know [Modigliani (1988: 16)], the simple fact that factor income dries up with retirement constitutes an important, perhaps the most important, incentive to saving. Social security removes that incentive, thus reducing private saving. Does it replace the lost private saving by government saving? As Feldstein (1974) pointed out, the answer depends on how social security is financed.

The actuarial principle would require social-security contributions to be paid into a fund placed in interest-earning assets. Upon retirement a participant would be receiving an annuity whose size would depend upon the size of his past contributions and the interest earned on them. Like the voluntary contributions of a private insurance scheme the mandatory contributions of a government scheme would be saved: government saving would indeed replace the lost private saving.

It would remain true, as often observed, that current annuities are taken from current output. But current output is a function of current labor and current accumulated capital stock. Whether accumulated as the result of government or private saving, the accumulating fund would be invested in an accumulating physical capital stock giving the economy a larger current output than would have been possible without the fund.

By contrast the pay-as-you-go principle requires social-security contributions to be collected in the form of a tax instantly spent on annuities in the form of transfer payments. No accumulating fund would be invested in an accumulating physical capital stock. No government saving would replace the lost private saving. Kotlikoff (1987: 415) estimates capital stock to be 20 to 30 percent less under pay-as-you-go social-security schemes on the scale common in advanced economies of the 1980s.

At their origins in 1889 and 1935, respectively, both German and U.S. social-security legislation embraced the actuarial principle but dropped it in 1957 and 1939, respectively, in favor of the pay-as-you-go principle. Sizeable funding of social security is found in Japan, Sweden, and Switzerland--all three lying above the regression line of figure 5.

3. Interpretation: Microeconomics

Consider a lender and a borrower in a capital market in which money may be placed and borrowed at the before-tax nominal rate of interest r. Let the rate of inflation be i and the tax rate T. The after-tax real rate of interest is then defined:

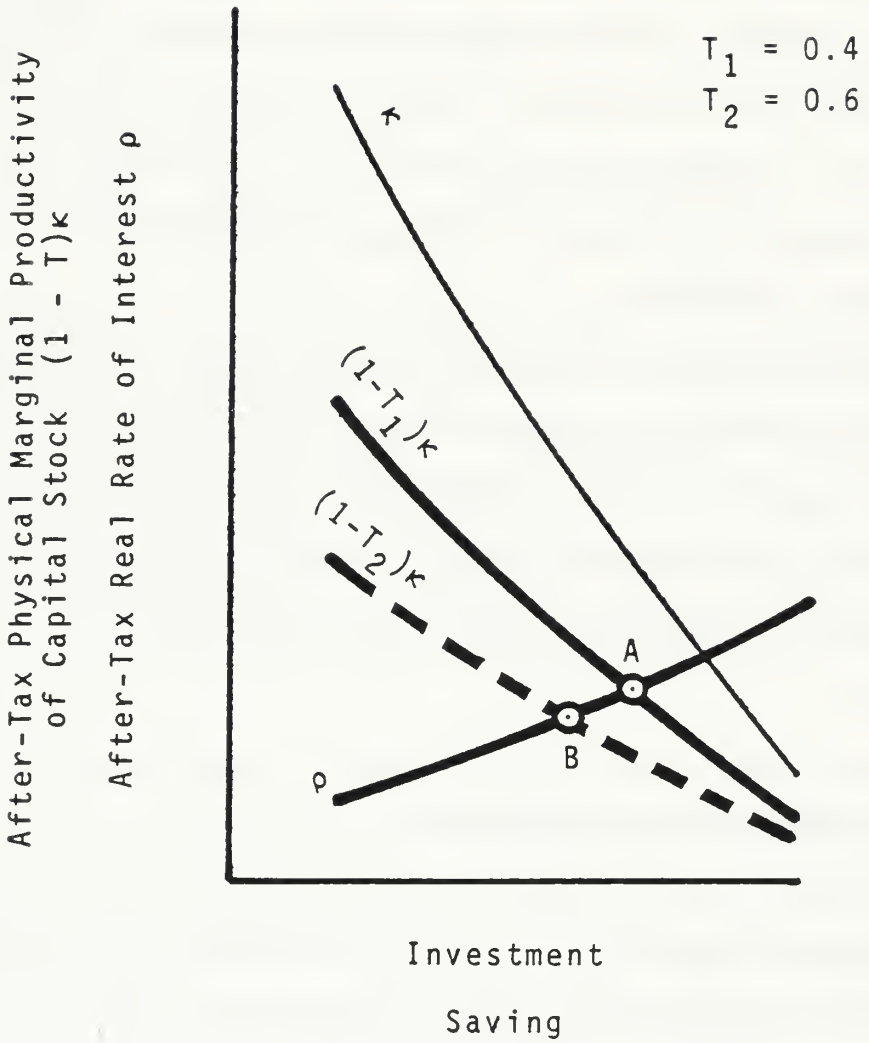
After-Tax Physical Marginal Productivity of Capital Stock (1 - T)κ
After-Tax Real Rate of Interest ρ
$T_1 = 0.4$
$T_2 = 0.6$
κ
$(1-T_1)\kappa$
$(1-T_2)\kappa$
A
B
ρ
Investment
Saving

Figure 6

$$\rho \equiv (1 - T)r - i \qquad (4)$$

Equation (4) is the after-tax real return on his capital facing a saver as a lender: his nominal interest return is taxable, and the real value of his asset is being eroded by inflation. Let a saver harbor neither money nor tax illusions, then his supply of saving will be a function solely of (4). Here a higher tax rate T will reduce (1 - T), and (4) can stay the same only as long as the before-tax nominal rate of interest r is in inverse proportion to (1 - T). For example, at an inflation rate i = 0.07 the after-tax real rate of interest can stay the same at, say, ρ = 0.05 only if at tax rates T = 0.2, 0.4, and 0.6 the before-tax nominal rate r were 0.15, 0.20, and 0.30, respectively, and indeed would be rising without bounds for T approaching one--the Feldstein (1976) effect. Can borrowers afford such rates? We turn to a borrower.

Let a firm be producing a single good from labor and a physical capital stock of that good. Let κ be the physical marginal productivity of that capital stock. The firm will[1] keep borrowing until after-tax physical marginal productivity equals after-tax real rate of interest:

$$(1 - T)\kappa = \rho \equiv (1 - T)r - i \qquad (5)$$

The right-hand side of (5) is equation (4) now representing the after-tax real cost of its capital facing the firm as a borrower: its nominal interest cost is tax-deductible, and the real value of its liability is being eroded by inflation. Can (4) stay the same if the tax rate is up?

Figure 6 shows the demand for borrowing and the supply of lending. A tax rate up from T_1 to T_2 depresses the after-tax physical marginal productivity from the solid to the broken curve: the firm can no longer afford the original (4). Equilibrium moves from A to B: investment, saving, and the after-tax real rate of interest ρ are down all three of them.

V. TAX AND GROWTH

1. Figure 7

Regress second and third columns of table III and find the elasticity -0.872 of the rate of growth g with respect to the tax burden R/Y to be clearly negative and to be a respectable -2.37 times its own standard error hence to differ from zero at a five percent level

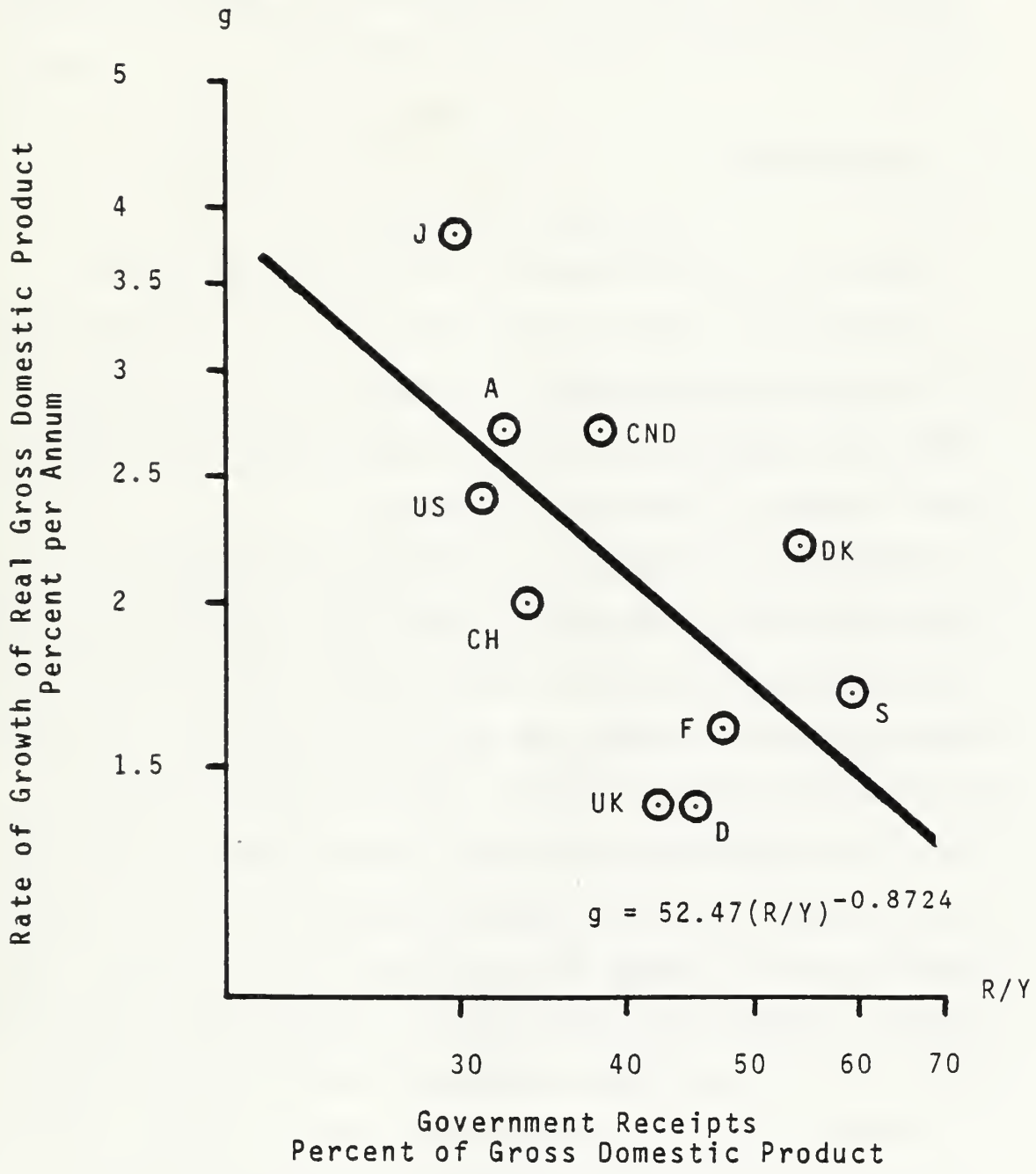
g
5
4
3.5
3
2.5
2
1.5
Rate of Growth of Real Gross Domestic Product
Percent per Annum
J
A
CND
US
DK
CH
S
F
UK
D
g = 52.47(R/Y)^-0.8724
R/Y
30
40
50
60
70
Government Receipts
Percent of Gross Domestic Product

Figure 7

of significance. We may safely conclude that a lower rate of growth will go with a higher tax burden. Why should it?

2. Interpretation

Some of our earlier findings may help us interpret figure 7.

International competitiveness implies a low rate of inflation and is one prerequisite for a high rate of growth. If, as in figure 1, a higher rate of inflation will go with higher government employment so will, in figure 7, a lower rate of growth.

Technological progress is the dominant source of growth. In early neoclassical growth models [Solow (1956)] technological progress fell like manna from heaven and was disembodied. In the real world, before technological progress can make its way into actual production it must, first, itself be produced. The research and development producing it takes time. Such research and development is one part of gross investment financed by gross savings. Second, once produced such technological progress must be embodied into new producers' goods physically different from those replaced. Such embodiment and replacement is another part of gross investment financed by gross saving.

In short, a high gross saving ratio is another prerequisite for a high rate of growth. If, as in figure 5, a lower gross saving ratio

will go with a higher tax burden so will, in figure 7, a lower rate of growth.

VI. SUMMARY AND CONCLUSION

The wide variation of the mix of the mixed economy among OECD countries has enabled us to do a cross-country regression analysis estimating six elasticities of economic variables with respect to the size of government. The elasticity of the rate of inflation was found to be positive, high, and statistically significant. The elasticity of the participation rate was found to be slightly positive but not to differ significantly from zero. The elasticity of hours per worker was found to be slightly negative but not to differ significantly from zero. The elasticity of overall labor supply was found to be minuscule and not to differ significantly from zero. The elasticity of the gross saving ratio was found to be negative, numerically high, and statistically significant. So was the elasticity of the rate of growth.

The ten OECD countries constituting our sample were all advanced capitalist economies to which standard economic theory ought to apply. The signs, sizes, and statistical significance, or lack of it, of our six cross-country elasticities were inconsistent neither with standard economic theory nor with empirical findings using domestic United States data.

We have made no attempt to estimate effects, however important, of the public goods and transfers[2] financed by government receipts. We have made no attempt to estimate effects, not directly[3] observable, upon an underground economy.

FOOTNOTES

*The author is professor of economics at the University of Illinois and is indebted to René Frey of Basel for advice. The author has benefited from discussions with Rolf G. H. Henriksson and Lars Werin of Stockholm, Lars Magnusson of Uppsala, Bo Sandelin of Gothenburg, and Walt McMahon of Illinois. For computational assistance the author is indebted to Murray Simpson, graduate student at the University of Illinois.

[1]A rigorous derivation of this familiar result is found in Brems (1983: 96-97).

[2]Lindbeck (1983) offered an extensive study of Swedish redistribution.

[3]Such effects may be indirectly observable: Frey-Weck (1983), (1984) observed the increase between 1960 and 1978 of determinants and symptoms of an underground economy and ranked 17 OECD countries according to such increase. Sweden was always at or near the top, Japan or Switzerland at or near the bottom of the list.

APPENDIX

TABLE I

INFLATION AND GOVERNMENT EMPLOYMENT

TEN COUNTRIES, 1979 OR 1980 TO 1986

	i	e/E
Australia	8.7	26.3
Canada	7.3	19.6[a]
Denmark	7.9	29.9
France	9.1	16.9
Germany	3.5	15.7
Japan	3.1	6.6[b]
Sweden	9.0	32.2
Switzerland	3.7	11.0
United Kingdom	8.1	21.9
United States	6.1	16.2

[a] 1980-1984.

[b] 1980-1985.

Sources: OECD (1988b: 38 and 83).

TABLE II

LABOR SUPPLY AND TAX BURDEN, TEN COUNTRIES, 1986

	F/P	L/F[a]	L/P[a]	R/Y
Australia	0.72	34.6	24.9	33.5[b]
Canada	0.74	32.3	23.9	39.2
Denmark	0.83	33.0	27.4	58.0
France	0.66	38.9	25.7	48.5[b]
Germany	0.66	40.5	26.7	44.7
Japan	0.72	40.4	29.1	31.3
Sweden	0.81	36.2	29.3	61.5
Switzerland	0.72	43.0	31.0	35.0
United Kingdom	0.75	42.7	32.0	41.9
United States	0.75	34.8	26.1	31.3

[a]Canada, Germany, Switzerland, and the United States: hours paid for. Other countries: hours actually worked. Denmark: manufacturing. Other countries: nonagricultural activities.

[b]1985

Sources: OECD (1988b: 34 and 64). ILO (1987: 669-673).

TABLE III

GROSS SAVING, RATE OF GROWTH, AND TAX BURDEN

TEN COUNTRIES, 1979 OR 1980 TO 1986

	S/Y	g	R/Y
Australia	19.5	2.7	32.5[a]
Canada	20.1	2.7	38.4
Denmark	14.1	2.2	54.2
France	20.2	1.6	47.3[a]
Germany	21.5	1.4	45.1
Japan	31.0	3.8	29.8
Sweden	16.9	1.7	59.2
Switzerland	28.7	2.0	33.9
United Kingdom	18.4	1.4	42.3
United States	17.1	2.4	31.1

[a]1980-1985.

Sources: OECD (1988b: 44, 64, and 70).

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